

Claims

- [c1] 1. An electrochemical cell, comprising:
 a first electrode;
 a second electrode;
 a membrane disposed between and in ionic communication with the first electrode and the second electrode;
 a first flow field in fluid communication with the first electrode and disposed opposite the membrane;
 a second flow field in fluid communication with second electrode and disposed opposite the membrane; and
 an electrically conductive pressure pad adjacent the first flow field and the first electrode, wherein the pressure pad comprises an integral mixture of at least one substoichiometric oxide of titanium and an elastomeric material.
- [c2] 2. The electrochemical cell of Claim 1, wherein the elastomeric material is particulate.
- [c3] 3. The electrochemical cell of Claim 1, wherein the elastomeric material is selected from the group consisting of silicones, fluorosilicones, fluoroelastomers, and mixtures comprising one or more of the foregoing elastomeric materials.
- [c4] 4. The electrochemical cell of Claim 1, further comprising a metal foil disposed in electrical communication with the pressure pad.
- [c5] 5. The electrochemical cell of Claim 1, wherein the pressure pad has a void volume of about 0.1% to about 90% based on the total volume of the pressure pad.
- [c6] 6. The electrochemical cell of Claim 5, wherein the pressure pad has a void volume of about 20% to about 80% based on the total volume of the pressure pad.
- [c7] 7. The electrochemical cell of Claim 1, wherein the substoichiometric oxide of titanium are represented by the formula $\text{Ti}_n\text{O}_{2n-1}$, where n is an integer of 4 or more.

- [c8] 8. The electrochemical cell of Claim 7, wherein the substoichiometric oxide of titanium are selected from the group consisting of Ti_4O_7 , Ti_5O_9 , Ti_6O_{11} , and mixtures comprising one or more of the foregoing.
- [c9] 9. An electrochemical cell collector plate comprising:
a first metal foil and a second metal foil wherein disposed between the first metal foil and the second metal foil is a layer comprising an integral mixture of an electrically conductive material and an elastomeric material.
- [c10] 10. The electrochemical cell collector plate of Claim 9, wherein the first metal foil comprises a metal selected from the group consisting of stainless steel, titanium, niobium, nickel, cobalt, hafnium, zirconium, tungsten, tantalum, and alloys and mixtures comprising one or more of the foregoing metals.
- [c11] 11. The electrochemical cell collector plate of Claim 9, wherein the second metal foil comprises a metal selected from the group consisting of stainless steel, titanium, niobium, nickel, cobalt, hafnium, zirconium, tungsten, tantalum, and alloys and mixtures comprising one or more of the foregoing metals.
- [c12] 12. The electrochemical cell collector plate of Claim 9, wherein the elastomeric material is selected from the group consisting of silicones, fluorosilicones, fluoroelastomers, and mixtures comprising one or more of the foregoing elastomeric materials.
- [c13] 13. The electrochemical cell collector plate of Claim 9, wherein the electrically conductive material is selected from the group consisting of copper, gold, silver, niobium, zirconium, tantalum, titanium, steels, nickel, cobalt, carbon, precious metals, substoichiometric oxides of titanium, and alloys and mixtures comprising one or more of the foregoing electrically conductive materials.
- [c14] 14. The electrochemical cell collector plate of Claim 9, wherein the integral mixture of an electrically conductive material and an elastomeric material is present in the active area of the collector plate and wherein a nonconductive material is present in the inactive area of the collector plate.
- [c15] 15. The electrochemical cell collector plate of Claim 9, wherein the integral

mixture of an electrically conductive material and an elastomeric a material is deposited on the first metal foil in a pattern, and wherein the pattern creates a flow field between the first metal foil and the second metal foil.

[c16] 16.The electrochemical cell collector plate of Claim 15, wherein the pattern is a radiating fin wherein the center of the collector plate is not anodized and the outer edges are anodized.

[c17] 17.The electrochemical cell collector plate of Claim 9, wherein the substoichiometric oxide of titanium are represented by the formula $\text{Ti}_n\text{O}_{2n-1}$, where n is an integer of 4 or more.

[c18] 18.The electrochemical cell collector plate of Claim 17, wherein the substoichiometric oxide of titanium are selected from the group consisting of Ti_4O_7 , Ti_5O_9 , Ti_6O_{11} , and mixtures comprising one or more of the foregoing.

[c19] 19.An electrochemical cell comprising:
 a first electrode;
 a second electrode;
 a membrane disposed between and in ionic communication with the first electrode and the second electrode;
 a first flow field in fluid communication with the first electrode and disposed opposite the membrane;
 a second flow field in fluid communication with second electrode and disposed opposite the membrane; and
 an electrochemical cell collector plate comprising a layer disposed between a first metal foil and a second metal foil wherein the layer comprises an integral mixture of an electrically conductive material and an elastomeric material.

[c20] 20.The electrochemical cell of Claim 19, wherein the substoichiometric oxide of titanium are represented by the formula $\text{Ti}_n\text{O}_{2n-1}$, where n is an integer of 4 or more.

[c21] 21.The electrochemical cell of Claim 20, wherein the substoichiometric oxide of titanium are selected from the group consisting of Ti_4O_7 , Ti_5O_9 , Ti_6O_{11}

11 , and mixtures comprising one or more of the foregoing.